Claims

1. A method of treating fiberglass fiber to increase its resistance to heat, the method comprising treating the fiber with a mixture of acids comprising at least 15% sulfuric acid for a period sufficient to increase the softening point of the fiber to at least 1000° C.

2. The method of claim 1 wherein the fiber is formed into a fabric before it is treated.

3. The method of claim 2 wherein the acid mixture further comprises at least one other mineral acid.

4. The method of claim 3 wherein the acid mixture comprises hydrochloric acid.

5. The method of claim 1 wherein the fiber is E-glass.

6. The method of claim 1 wherein the fiber is soaked in an acid bath for a period in excess of twenty-four hours.

7. The method of claim 2 comprising a further step of treating the fabric with a low viscosity resin after the acid treatment step.

8. The method of claim 7 wherein the resin is a silicone oil.

9. The method of claim 8 wherein the silicone oil is a water in oil emulsion.

10. A composite material comprising at least one layer containing a thermoplastic, the layer having embedded therein a fabric, the fabric being coated with an active thermal protective material selected from the group consisting of subliming materials and intumescing materials.

11. The composite of claim 10 wherein the coated fabric comprises an open mesh having from 0.5 to 30 openings per square centimeter, the thermoplastic in the layer extending into the openings and forming a mechanical lock with the coated fabric.

12. The composite of claim 10 wherein the fabric comprises fiberglass fiber having a softening point above about 850° C.

13. The composite of claim 10 wherein the active thermal protective material leaves openings in the weave of the fabric, the thermoplastic material extending into the openings and forming a physical lock with the coated fabric.

14. A container formed of the composite of claim 10.

15. The container of claim 14 wherein the container is a structural automotive container selected from the group consisting of trunk bases and fuel tanks.

16. A structural automotive component having a bottom and an upstanding wall, the pan being formed of the composite material of claim 10.

17. The component of claim 16 wherein the mesh is on a lower side of the bottom and the outside of the upstanding wall.

18. The component of claim 17 wherein the fabric mesh is a single piece of material extending across the bottom and up at least a part of the upstanding wall.

19. The component of claim 16 wherein the fabric comprises fiberglass fiber having a softening point above about 850° C.

20. The component of claim 19 wherein the fabric comprises fiberglass fiber having a softening point above about 1000° C.

21. The component of claim 20 wherein the fabric has been treated with a mixture of acids comprising at least 15% sulfuric acid.

22. The component of claim 16 wherein the component is a trunk base.

23. The component of claim 16 wherein the component is a fuel tank.

24. The component of claim 16 wherein the component is an inverted pan formed in part of thermoplastic-coated fibers, the fabric mesh being embedded in an inside surface of the pan.

25. A method of forming a composite structure comprising a step of coating a fabric with an active thermal protective material selected from the group consisting of subliming and intumescing materials, and thereafter a step of softening a resin component of a substrate and embedding the coated fabric in the softened resin.

26. The method of claim 25 wherein the substrate is a sheet, and wherein the sheet and the fabric are formed into a structure simultaneously with the step of embedding the fabric in the sheet.

27. The method of claim 25 wherein the active thermal protective material leaves openings in the weave of the fabric, the softened resin extending into the openings and forming a physical lock with the coated fabric.

28. A composite material comprising at least one layer of thermoplastic having embedded therein a fabric produced by the method of claim 2.

29. A composite material comprising at least one layer of thermoplastic having embedded therein fibers produced by the method of claim 1.

30. A thermal protective composition having dispersed therein fibers produced by the method of claim 1.

31. In combination, a thermal protective material and a fiberglass fabric embedded therein, the fabric having been treated by the method of claim 2.

32. The combination of claim 31 wherein the thermal protective material is a coating applied to a substrate.

33. The combination of claim 31 wherein the thermal protective composition is preformed into a self-supporting structure.

34. A method of protecting a substrate from fire or thermal extremes comprising applying to the substrate an uncured thermal protective material selected from the group consisting of intumescent materials and subliming materials, and thereafter a step of embedding in the thermal protective material a fiberglass fabric produced by the method of claim 2.

35. A structure comprising an organic resin having embedded therein a fabric, the fabric being precoated with an active thermal protective material selected from the group consisting of subliming and intumescing materials.

36. The structure of claim 35 wherein the organic resin is a polyolefin.

37. A method of treating fiberglass fiber to give it superior high temperature resistance and texture, the method comprising treating the fiber with acid and

thereafter soaking the fiber in a water-in-oil emulsion of low viscosity organo-metallic oil to fill pores in the glass.

38. The method of claim 37 wherein the low viscosity organo-metallic oil is a low molecular weight silicone oil.

39. The method of claim 38 wherein the silicone is dimethyl polysiloxane.

40. The method of claim 37 wherein the step of treating the fiber with acid comprises treating the fiber with a mixture of acids comprising at least 15% sulfuric acid for a period sufficient to increase the softening point of the fiber to at least 1000° C.

41. A method of forming a composite structure comprising a step of treating a fabric with an active thermal protective material selected from the group consisting of subliming and intumescing materials, a step of placing the treated fabric in a mold, and a step of forming a substrate into a shape in the mold containing the treated fabric.

42. The method of claim 41 wherein the substrate comprises a thermoplastic resin, the step of forming the substrate comprising heating the resin at least to a softening temperature, the treated fabric bonding to the softened resin.

43. The method of claim 41 wherein the substrate is heated to a temperature below an activation temperature at which the active thermal protective material intumesces or sublimes.

44. The method of claim 41 wherein the fabric comprises fiberglass.

45. The method of claim 41 wherein the substrate comprises a felted material.

46. The method of claim 41 wherein the coated fabric includes windows therein, the substrate extending through the windows to lock the coated fabric to the substrate.

47. The method of claim 41 wherein the structure is an automotive trunk base, or trunk liner, or fuel tank.

48. The method of claim 41 wherein the resin comprises a polyolefin.

49. A composite structure comprising a substrate, the substrate being formed at least in part of a thermoplastic material, and a thermal protective structure adhered to the substrate, the thermal protective structure comprising a fabric coated with an active thermal protective material, the thermal protective material being selected from the group consisting of subliming and intumescing materials, the substrate adhering chemically and mechanically to the pretreated mesh fabric.

50. The structure of claim 49 wherein the thermal protective structure is adhered to the substrate by the thermoplastic material.

51. The structure of claim 49 wherein the thermal protective structure is embedded in the thermoplastic material.

SUB A8

52. A composite structure comprising a substrate, the substrate being formed at least in part of a polyolefin, and a mesh fabric treated with an active thermal protective material, the thermal protective material being selected from the group consisting of subliming and intumescing materials, the treated mesh fabric having from 0.5 to 30 openings per square centimeter, the resin adhering chemically and mechanically to the pretreated mesh fabric.

53. The structure of claim 52 wherein the polyolefin is polypropylene.